Uppmätta och modellerade nivåer av trafikrelaterade luftföroreningar i tidsseriestudier

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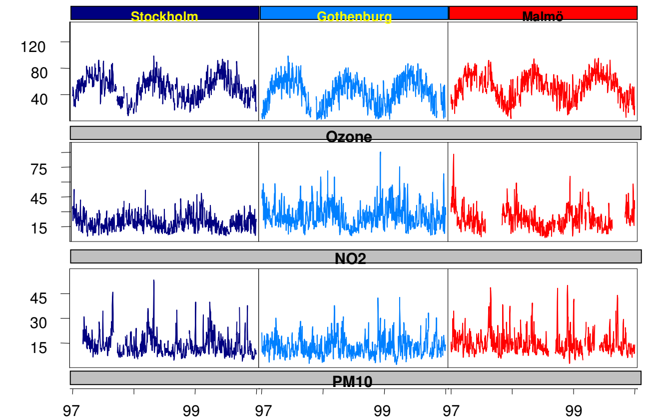
Time series studies



Air pollution – health time series

- The same (almost) panel or population is studied day after day for months-years
- Variations in exposure are temporal
- Health responses are fast (some delayed)
- Confounders must also vary over time
- Co-variation between pollutants may be lower than the spatial (for example road dust and vehicle exhausts)

Air pollution – health time series

- Daily number of deaths (cause specific)
- Daily number of hospitalised
- Daily number of emergency visits

- Symptoms, demand medication
- Lung function (PEF, FEV1…)
- Biomarkers (Fibrinogen, eNO…)
- HRV

Potential confounders that may need to be included in analyses

- Influenza epidemics
- Weather (temperature, humidity…)
- Calender variables (day of week, holidays, season, year…)
- Pollen concentration

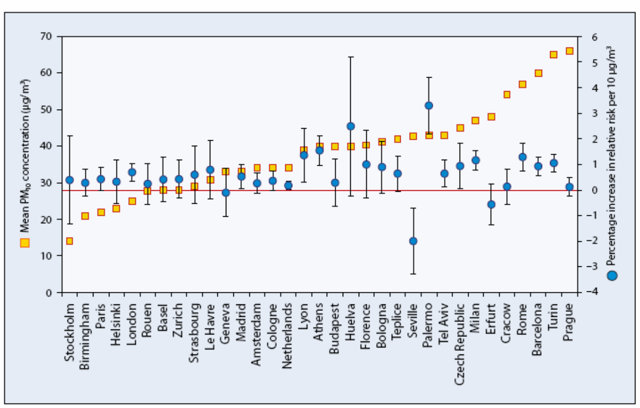
Register studies

Daily N of hospital admissions, ER visits, deaths *ETC*.

- Delay in official data (cause of death: ~2yrs)
- Analysis typically at city (population) level
- The daily number of events is used (population seen as almost ”constant”)
- ERF usually linear without threshold
- Several pollution lags may be studied
- ”Golden standards” tend to exist

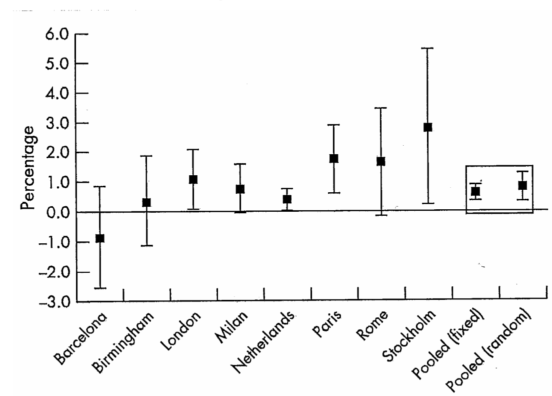
Time-series register studies have often been used for combined analyses and comparisons

Fig. 2. Ranking of PM_{10} effect estimates for all-cause mortality by annual average levels of PM_{10}

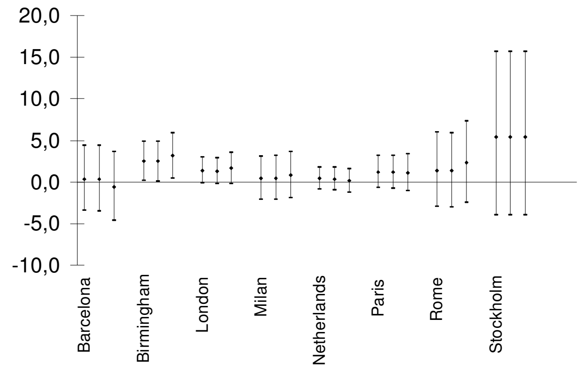


Source: Anderson et al. 2004 *(2)*.

PM10 and daily number of cardiac admissions in APHEA2, Le Tertre et al (RR; % per 10 µg/m3 increase in lag 01)



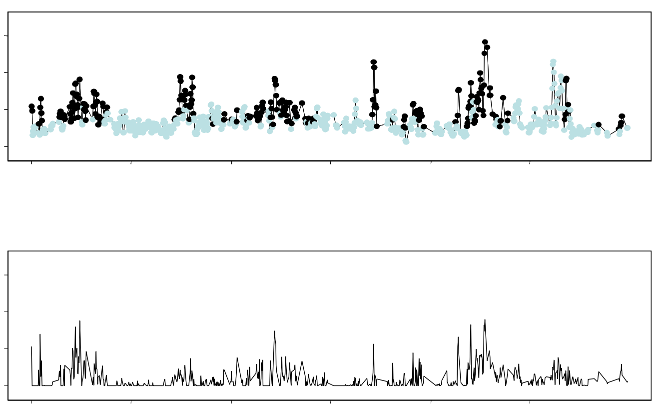
PM10 and daily number of asthma admissions in APHEA2, Atkinson et al, HEI reanalysis project (RR; % per 10 µg/m3 increase in lag 01)



Studies of traffic related pollutants

- VV Study: RR for PM10 on road dust days and other days
- PASTA: RR for PNC, NOx and modeled PNC
- TRAPART: RR for road dust PM10, NOx, LRTAP PM10, ozone (and soot)
- HÄMI: RR for coarse PM, NOx, PM2.5, ozone

High levels of local PM - road dust days (upper)



Short-term effects of particle number concentration on daily hospital admissions and daily mortality

Kadri Meister, Umeå University
Bertil Forsberg, Umeå University
Christer Johansson, Stockholm University

Material and methods

- Measured urban background PNC at Söder May 2001 – November 2003
- PM_{10} and ozone from the same site
- Modelled urban background PNC 1998 – 2002
  - Exposure modelled for monitoring site, area-weighted and population-weighted
- The daily number of deaths (excl ext causes), acute cardiovascular hospital admissions and acute respiratory admissions in Greater Stockholm (1.2 m inhabitants)

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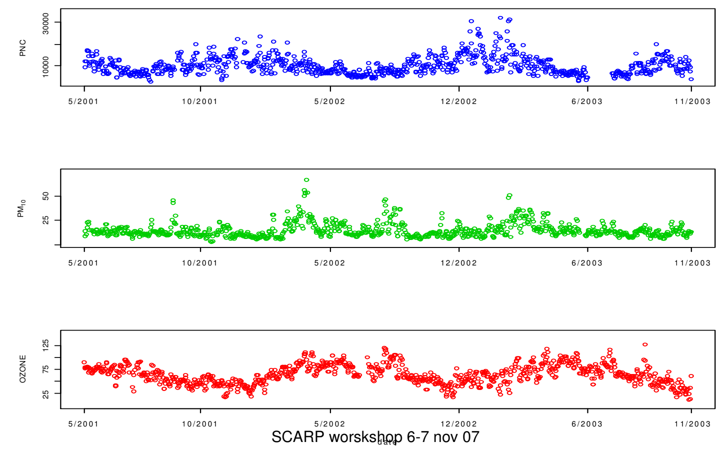
Urban background PNC, PM_{10} and ozone (lag 01)
May 2001 – Nov 2003



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Data was analysed using additive Poisson regression models for overdispersed counts

Models include:

- Pollutants; PNC, PM_{10}, ozone (all lag 01)
- Day of week as dummy variable
- Time-trend as a smooth function (seasons)
- Temperature and dew point temperature (simultaneously both lag 0 and lag 12) as smooth functions
- Daily number of influenza hospitalisations as a smooth function

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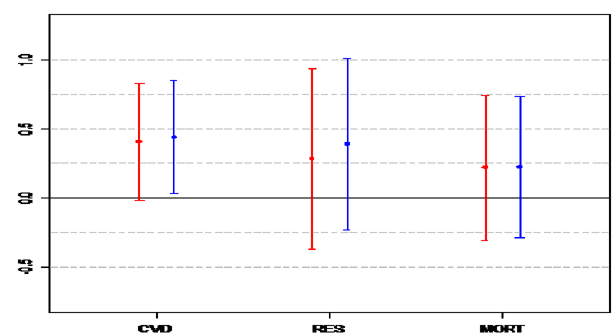
RR (%) per 1000/cm³ increase in measured PNC (lag 01) with PM_{10} simultaneously in the model (IQR = 5124)



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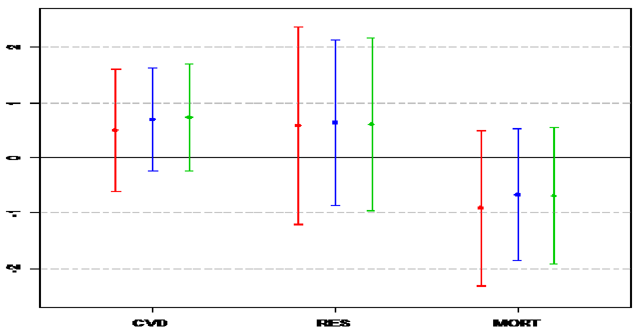
RR(%) per IQR increase in modelled PNC lag01
The Södermalm site, area-weighted, population-weighted



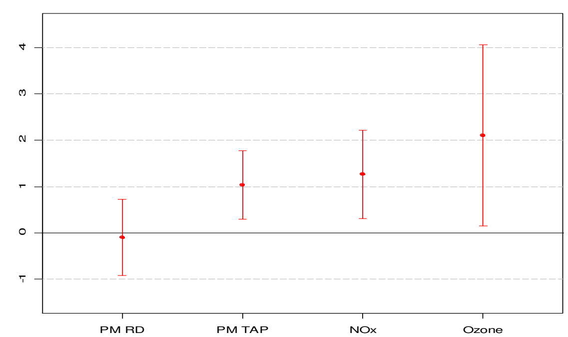
Conclusions

- Stronger evidence for measured PNC to be related to health than modelled PNC
  - the latter depends on variables already included in the model
- An IQR increase in lag 01 was associated with stronger effects for measured PNC than for PM_{10}, especially for cardiovascular admissions
- Exhaust particles are smaller and have different composition which may explain this difference in effects

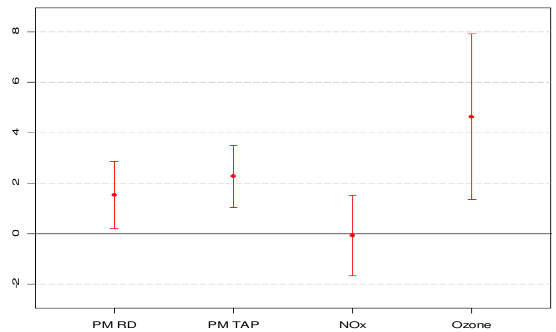
TRAPART (EMFO)

- 24-h concentrations of urban and rural PM10 and NOx 1998-2005 from Stockholm were used to estimate
  - Local contribution to urban backgr PM10
  - Local PM10 contribution excluding local exhaust PM = using contribution to NOx
- PM*roaddust* = (PM10*urban* - PM10*rural*) - 24/1000(NOx*urban*-NOx*rural*)

CVD hospital admissions
RR (%) per IQR increase in lag 01



Resp hospital admissions
RR (%) per IQR increase in lag 01



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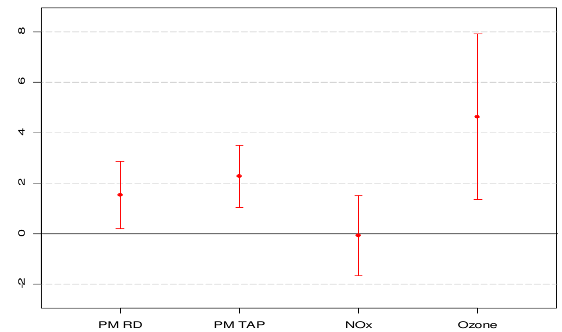
Resp hospital admissions
RR (%) per IQR increase in lag 01



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(from ERS 2007)

Emergency visits for asthma in Stockholm are associated with levels of coarse PM

Bertil Forsberg, Umeå University, Sweden
Kadri Meister, Umeå University, Sweden

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Material and methods

Daily number of respiratory emergency department visits in Greater Stockholm (1.1 m) from January 2001 through December 2005.

In particular intrest the daily number of visits for

- asthma (ICD10: J45-J46)
- asthma not specified as allergic (ICD10: J45.1 + J45.9)

	Mean	Min	Max	IQR
All respiratory causes	89.5	8	204	87
Asthma	22.2	0	71	25
Asthma not specified as allergic	12.8	0	41	11

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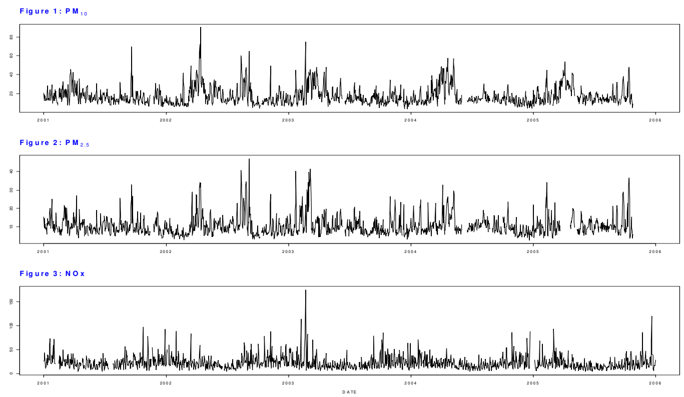
PM10, PM2.5 and NOx



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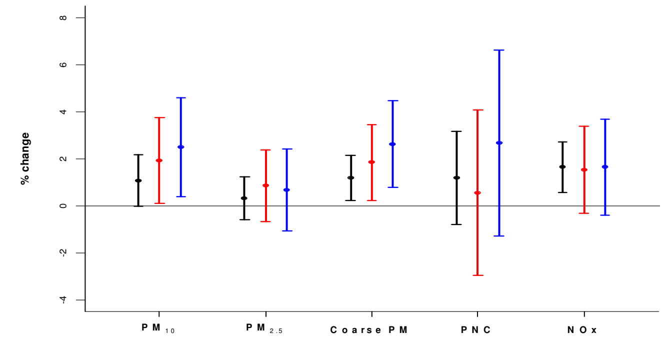
RR(%) per IQR increase in pollutant (lag01)

all respiratory, asthma, non-allergic asthma
(model adjusted for weather, influenza, pollens, ozone)



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Results and conclusions

- In two-pollutant models examining lag01 of pollutant IQR increase of PM_{10} and coarse PM were associated with 1.8 - 2.6% increases in asthma and non-allergic asthma visits.
- Single-pollutant models (without O_3) gave similar associations for asthma and the subgroup.
- Coarse particles, in Stockholm mainly originating from road dust, seem to worsen asthma and increase respiratory emergency department visits.
- There is also a significant association between NOx and all respiratory visits indicating an effect of traffic exhaust

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Summary

- ERF for urban background levels of traffic related pollutants are policy relevant
- Effects seem to be different from road dust (+ coarse PM) and vehicle exhaust
- Modeled fluctuations would be more easy to use if they not build on covariates that must be in epidemiological models (weather, day of week, season …) but instead NOx, traffic flow *ETC.*
- Very few population based time-series studies have yet focused on subgroups defined by distance to major road *ETC.*
- Potential improvement: Urban background fluctuations + effect modification by type of area

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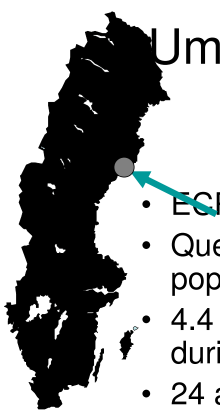
Panel studies

for example asthma panels

- Health endpoints in analysis may be dicotomous (Y/N) as well as continous (daily prevalence, lung function etc.)
- Analysis at individual or group level
- Drop outs may change the panel
- Reporting may change over time
- Medication may vary and cause proplems
- Strong autocorrelation

Umeå – asthmatics



- ECRHS centre
- Questionnaire to the initial screening population also in ECRHS II
- 4.4 % reported an asthma attack during the last year and were invited
- 24 accepted to participate in the asthma diary study

Asthma panel

- 54 % were females
- Aged 30 – 52 years (mean 39)
- 38 % on daily asthma medication
- All but one used need medication
- 14 % were smokers, 32 % ex smokers
- 91 % had a job

Study period

- October 9 – December 10 (2000)
  10 weeks
- The period was mild and humid
- 24h PM2.5: 3 – 18 µg/m3 (roof level)
- PM2.5 increased with temperature

Analysis

- The logistic regression analysis adjusted for person, temperature, humidity, ozone, fever, day of week and time trends
- Person-days with less than 12 hours in the study area were excluded (127 of 1680)
- Odds ratios were calculated for an inter quartile range (IQR) increase in exposure

Results (odds ratio) for IQR increase in PM2.5